South Africa’s water situation & its impact on urban parks (IERM)

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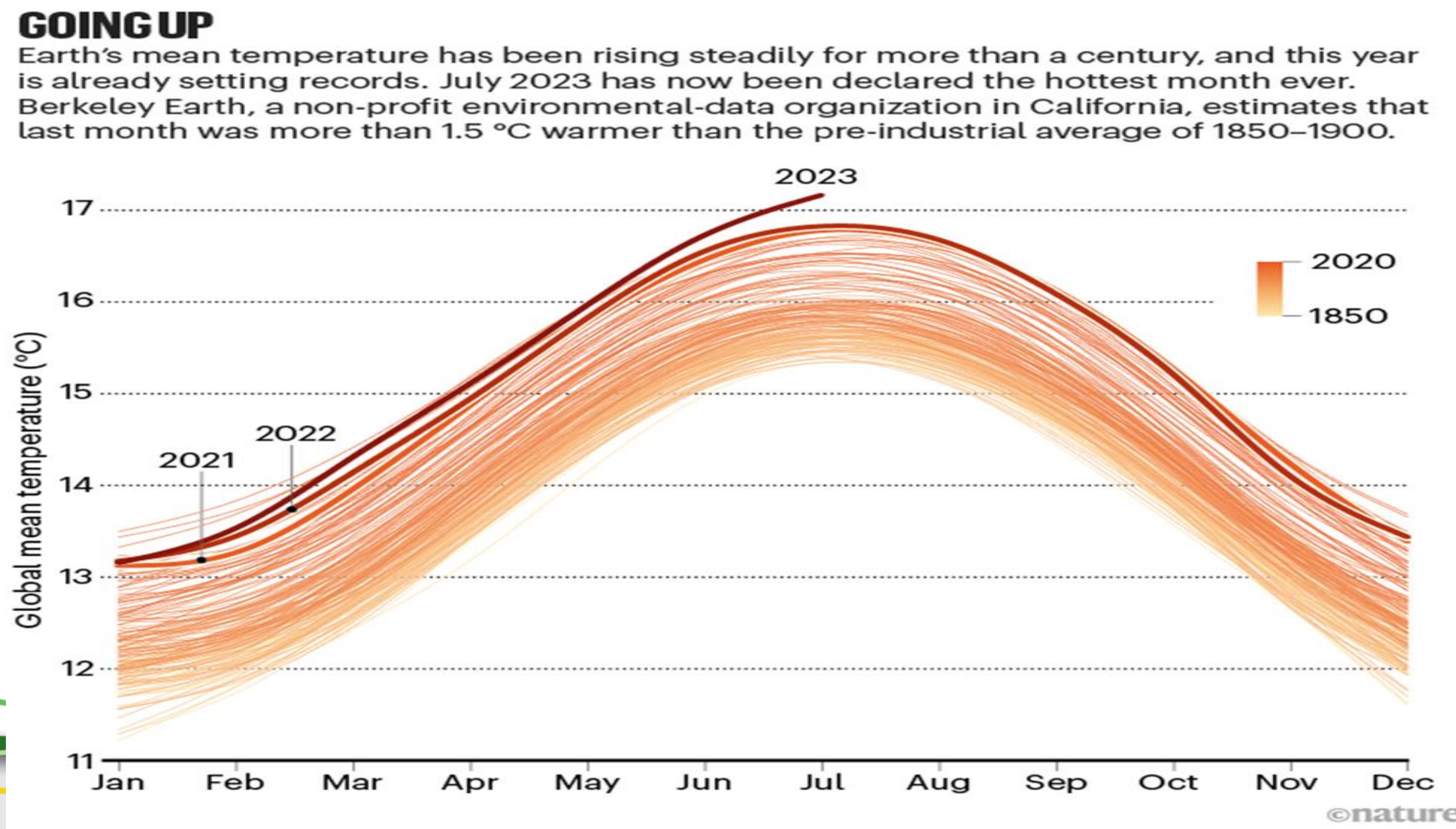
All around us the "Climate" is changing, whether it be;

- Climatological
- Environmental
- Societal
- Economically , or even
- Habits and actions.

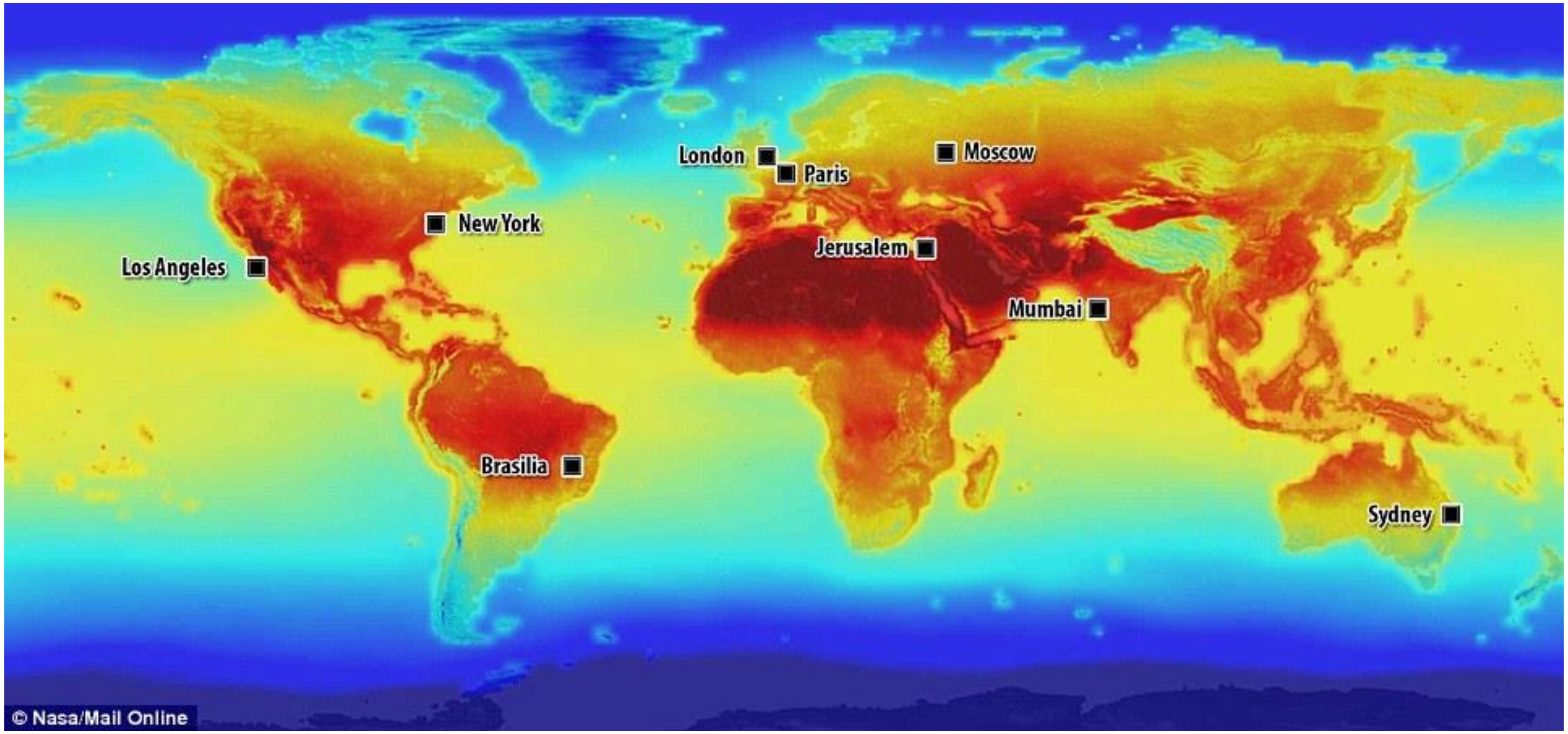
Our world is becoming hotter by the year

- July is typically the hottest month of the year, and this July shattered records going back as far as 1850 by around 0.25 °C. **Overall, the average global temperature was 1.54 °C above the preindustrial average for July 2023**, according to Berkeley Earth, a non-profit group in California that is one of several organizations tracking global warming



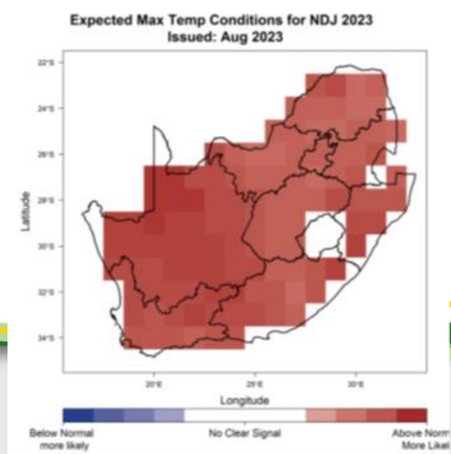
Nasa has released new data that show how temperature and rainfall patterns will change around the world by 2100.

This map, shows the maximum daily temperatures in July under climate scenarios that predict carbon dioxide levels in the atmosphere will reach 935 parts per million



El Niño and next few months weather

- An El Niño condition occurs when surface water in the equatorial Pacific becomes warmer than average (on the west coast of S America) and east winds blow weaker than normal. This also results in cooler water along the coast of New Zealand. The opposite condition is called La Niña.
- El Niño-Southern Oscillation (ENSO).
- ENSO's typical impact on Southern Africa is in favour for generally drier (drought) and warmer conditions during the summer seasons from October to March. (This tends to impact Australia in the same manner).
- Rainfall forecast **for period Oct 2023 to Jan 2024 indicates below-normal rainfall over the central parts of the country and above-normal rainfall for the north-east**. However spring and early summer rains may be higher than average in some parts of SA. In general the minimum temperatures as well as maximum temperatures will be higher than normal.

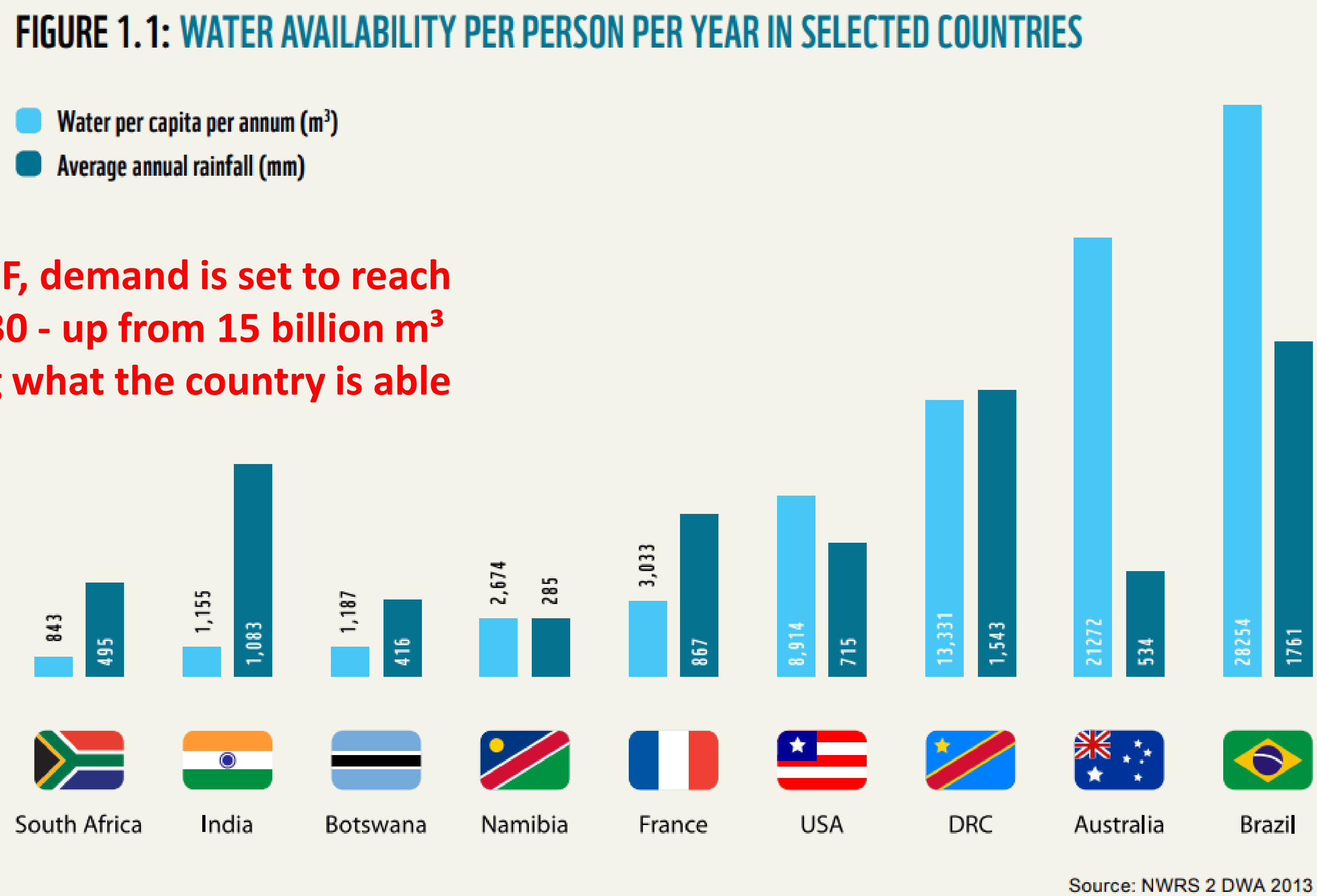


What is our current water situation?

"Rainfall records from 1900's till 1980's show that the **annual rainfall has been decreasing since 1968**" UNEP, 2002

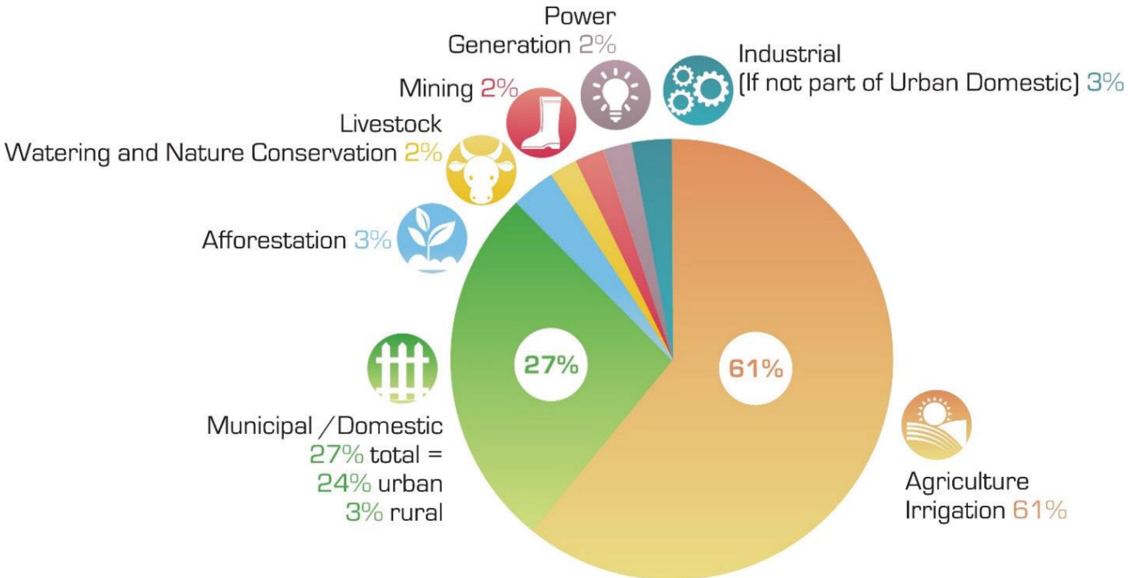
"The **number of disasters has increased in frequency** and severity in the past 30 years" UNEP, 2002

According to the WWF, demand is set to reach 17.7 billion m³ by 2030 - up from 15 billion m³ in 2016 - outstripping what the country is able to allocate.



The water situation in South Africa

The current state of our freshwater resources

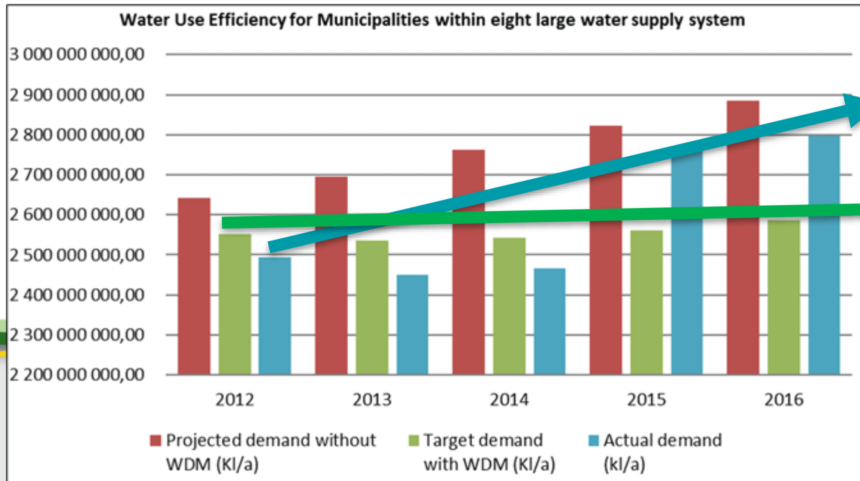


How we use our water resources in South Africa

DWS master plan 2018

- South Africa is currently withdrawing 15.6 km³ of water per annum, while the current supply is 14.6 km³.
- ***Demand > supply***.

- **Municipal and domestic water use = 27.1% (Compared to 11% - Worldwide)** (WRC 2018)



Actual demand/use

Target demand

DWS master plan 2018

The water situation in South Africa

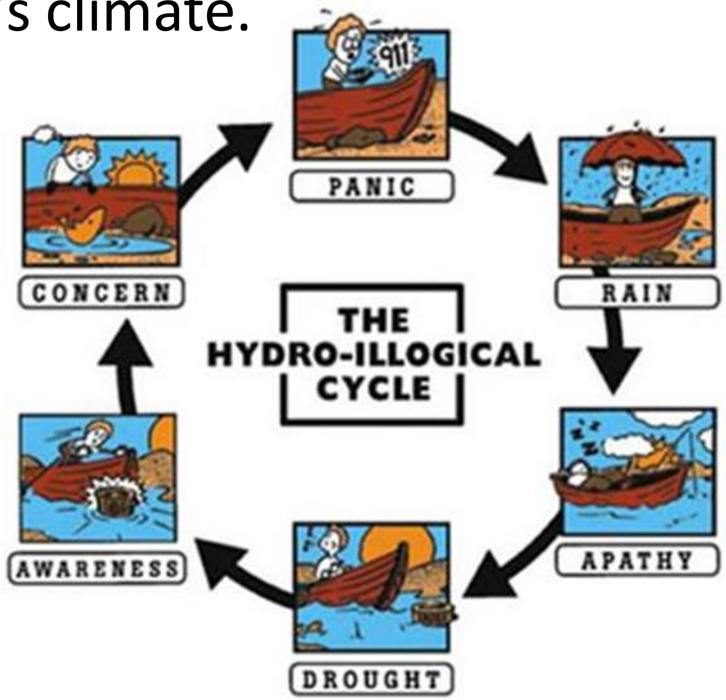
Drought & water scarcity in South Africa

- Average annual rainfall in South Africa is only about 495 mm, Australia 419 mm, whereas the world average is 1 033 mm. (some sources vary slightly)
- South Africa has an ***extremely variable climate*** over space and time.
- South Africa is naturally ***water scarce***: (defined as - water supplies drop to below 1 000 m³ potable water per person per year)
- Rain distribution varies across SA – generally reducing from east to west,
- **65%** of the country receiving less than 500 mm of rain a year

The water situation South Africa

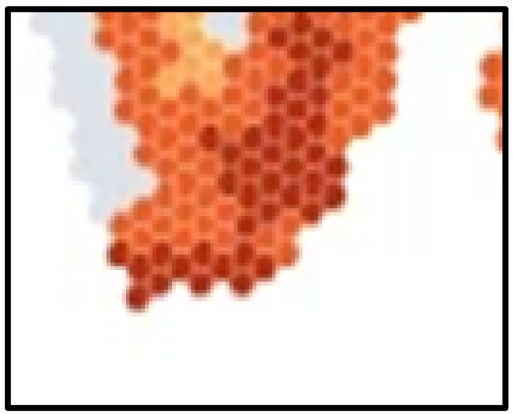
Drought in South Africa

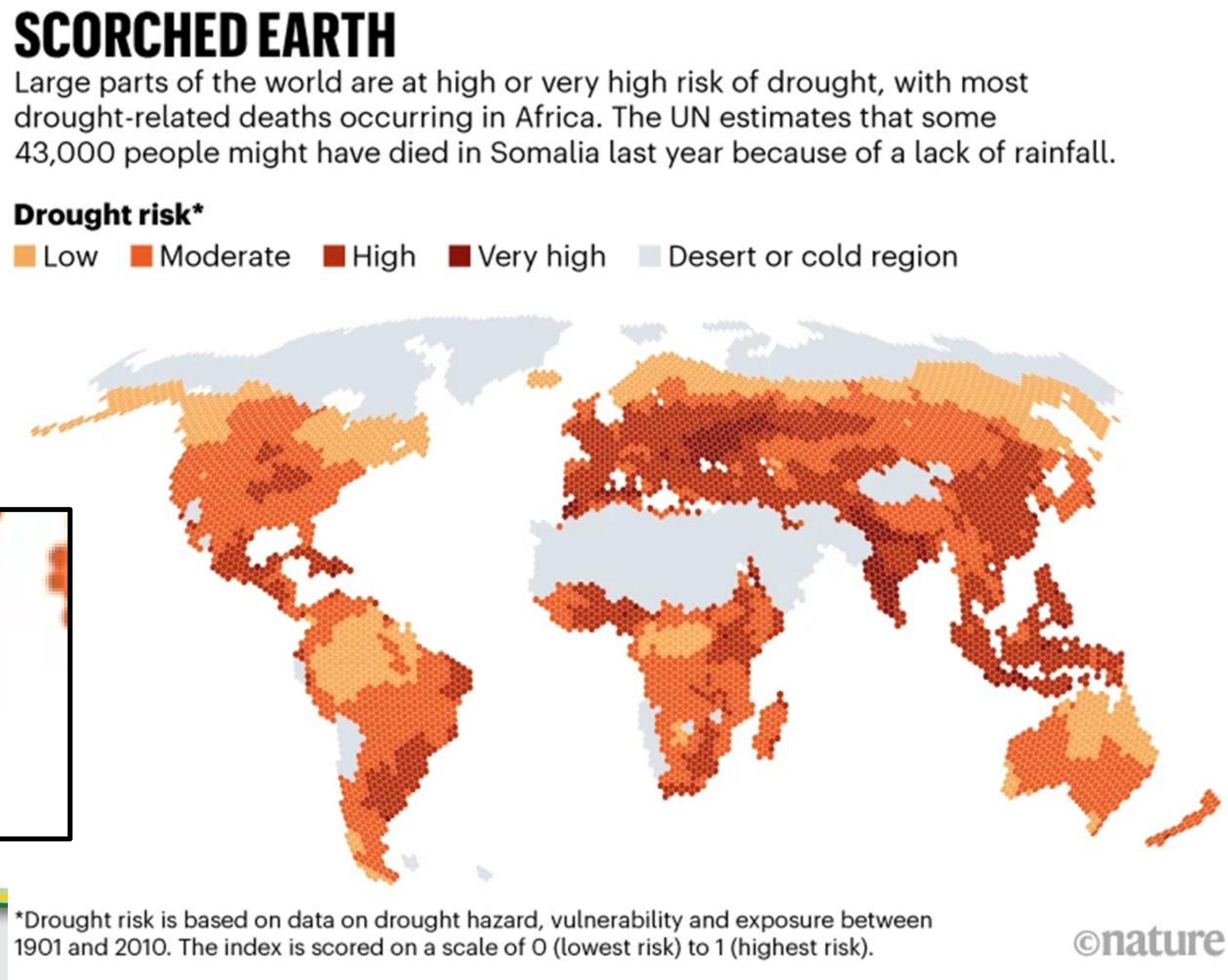
- ***Droughts*** are a major feature of SA’s climate.
- Previous severe droughts occurred
  - from 1925 to 1933,
  - from 1944 to 1946,
  - from 1950 to 1952,
  - from 1962 to 1971,
  - 1982 to 1995,
  - 2016,
  - and more recently 2017 – 2022 (in diff parts of SA).



The water situation in South Africa

The drought risk, based on historical data, for most of SA is unfortunately moderate to very high.

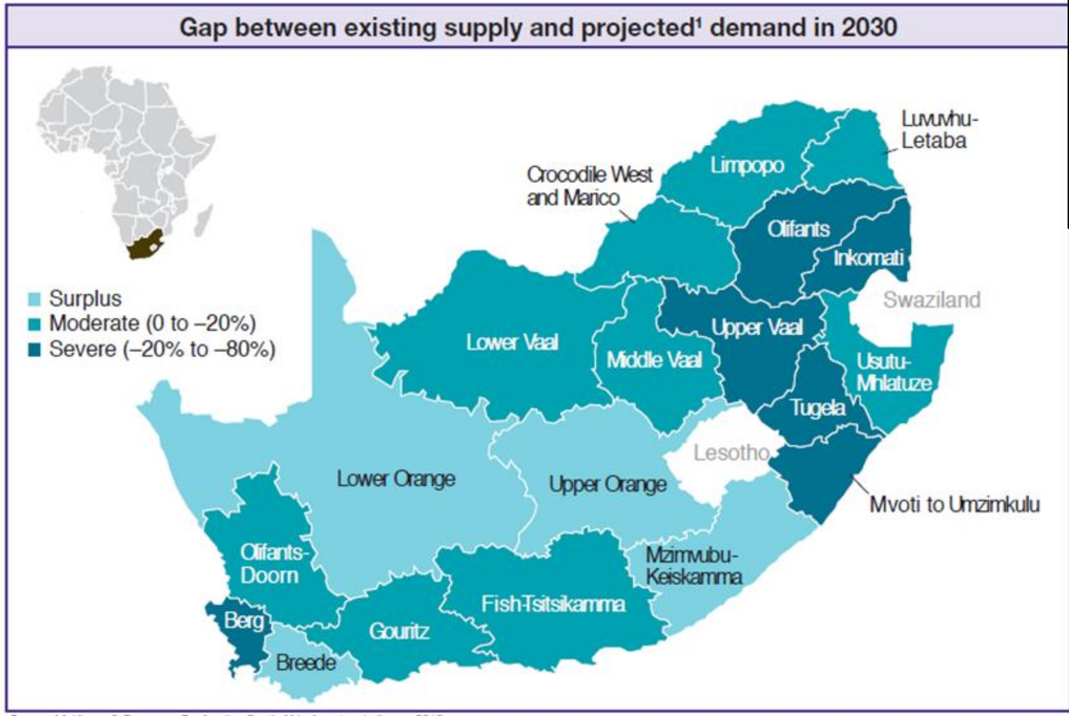




The water situation in South Africa

- By 2005, 95% of our freshwater resources had already been allocated.
- 41% of water is lost once it enters the distribution system (Non-Revenue Water).
- **In 2015 the blue, green and no drop reports, water losses were <u>(35%) vs 2023 (50%)</u> (Turton)**

By 2030 - a shortfall of approximately 25% between available water supplied and demand.
An extreme water shortage of -20% and -80% will be experienced by 6 of the 19 water management areas in South Africa (Boccaletti, et al., 2010).



Source: McKinsey & Company, Confronting South Africa's water challenge, 2010
[1] Frozen irrigation levels and limited ability to increase rainfed land will drive an increase in virtual water trade between water-management areas and internationally with trading partners.

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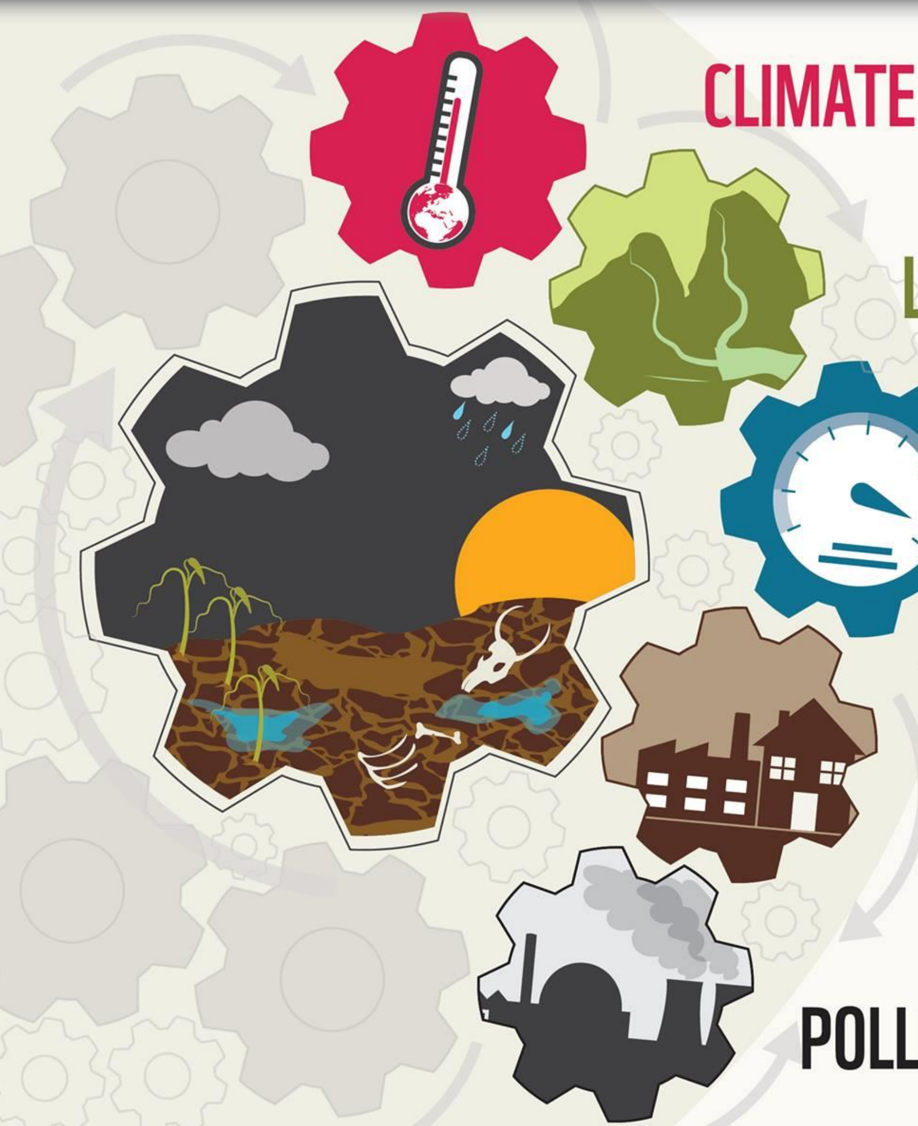
SOUTH AFRICA'S WATER (CRISIS) CYCLE

FOR NATURE. FOR YOU. WWF



CLIMATE

CHANGE IS ALREADY HERE

Droughts and floods are our future. **We have to start adapting now!**

LAND

CATCHMENTS IN CRISIS

Alien plants are **drying up our catchments** and we're **losing precious topsoil.**

WATER USE

WE'VE LOST COUNT, LOST SIGHT AND LOST OUR WAY

We need to know how much we're using and losing in order to **save water** and to **use it more effectively.**

CITIES

NOT YET WATER SENSITIVE NOR WATER SMART

We could re-use more water using **climate smart technologies** and natural infrastructure.

POLLUTION

AGEING AND FAILING INFRASTRUCTURE

We have to ensure **polluters pay and clean up**, and we need better waste management.

The water situation in South Africa

<u>Some other significant challenges that we face in SA</u>:

1. Water Leaks (domestic and reticulation systems)
2. Water abstraction management & monitoring needs improvement
3. Inefficient supply systems
4. Polluted water sources from municipalities, industries and home owners
5. Supply systems have not necessarily kept up with new growth
6. Illegal connections
7. Lack of maintenance on supply systems
8. Increased demand from growing/increased
   a) population
   b) industrialization
   c) agriculture
9. Increased cost of water
10. Climate change

<u>Challenges facing our water resources</u>

Water pollution
Urbanisation / industrial effluent
Ineffective wastewater treatment works
Agriculture / eutrophication / soil erosion
Destruction of wetlands

Soil erosion

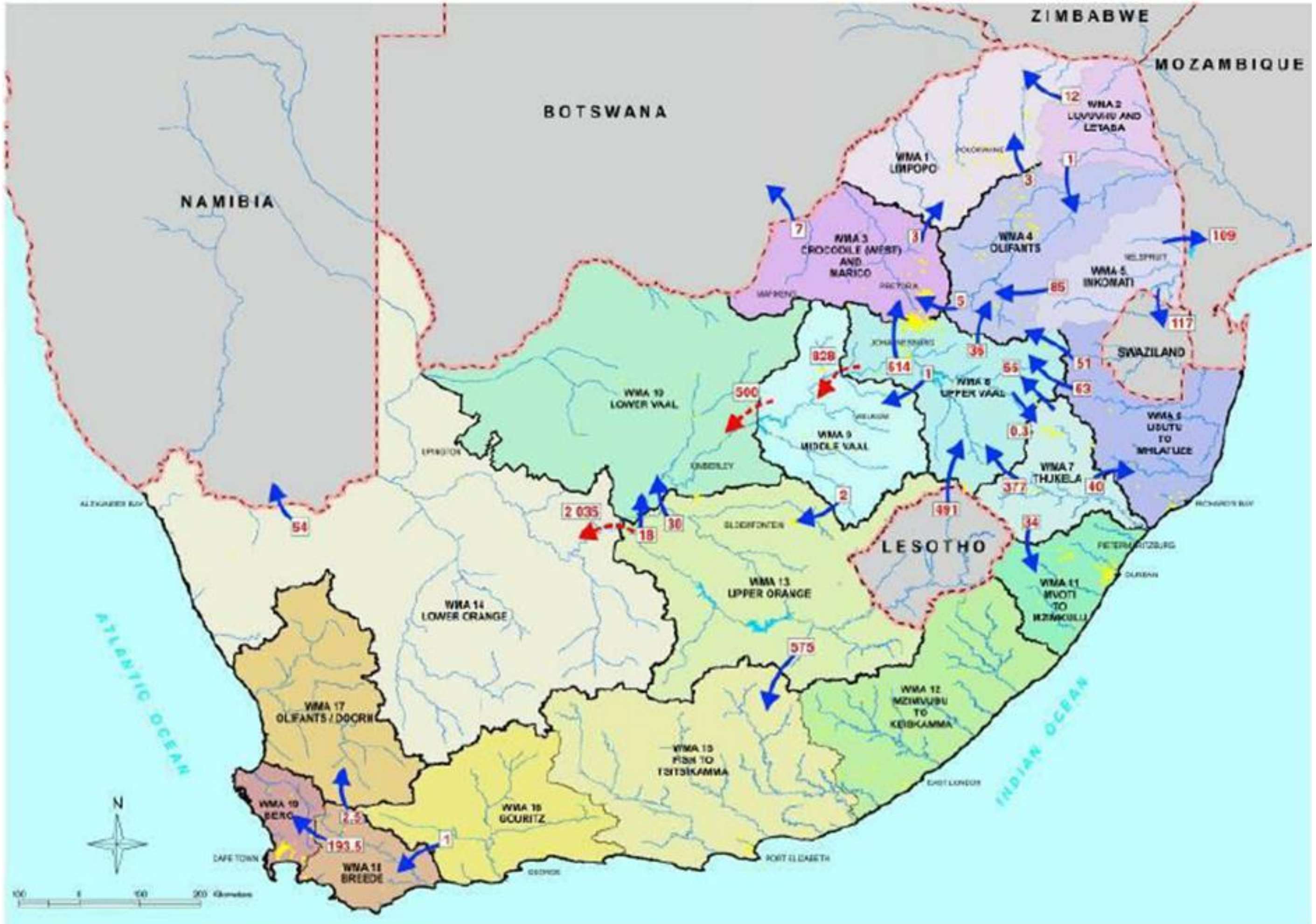
More than 60% of South Africans live in urban areas
"Over 65% of South Africa's wetlands and associated river systems are damaged, and 50% have been destroyed" – (Rebelo, 2018)

Draining wetlands for farming

Lead batteries

Do you know where your tap water comes from?

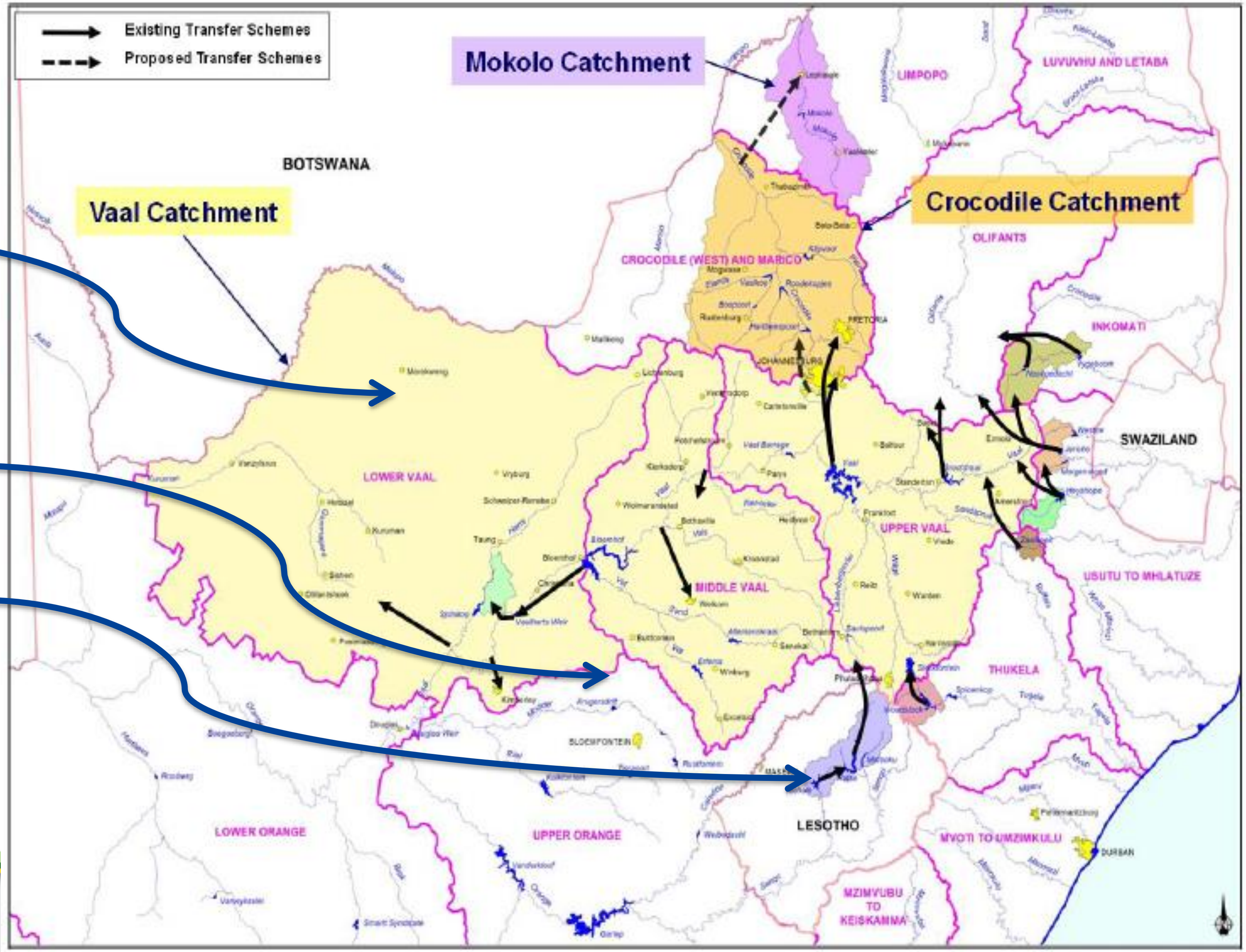
Inter basin transfers and return flows



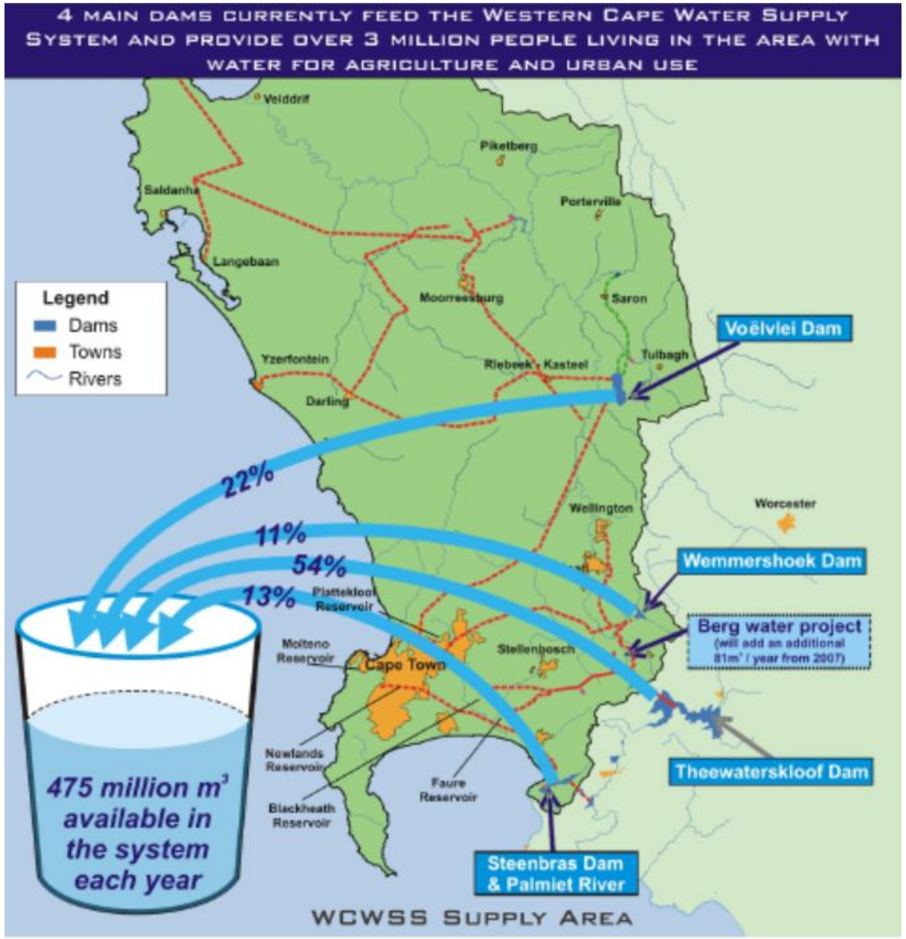
Inter basin transfers and return flows

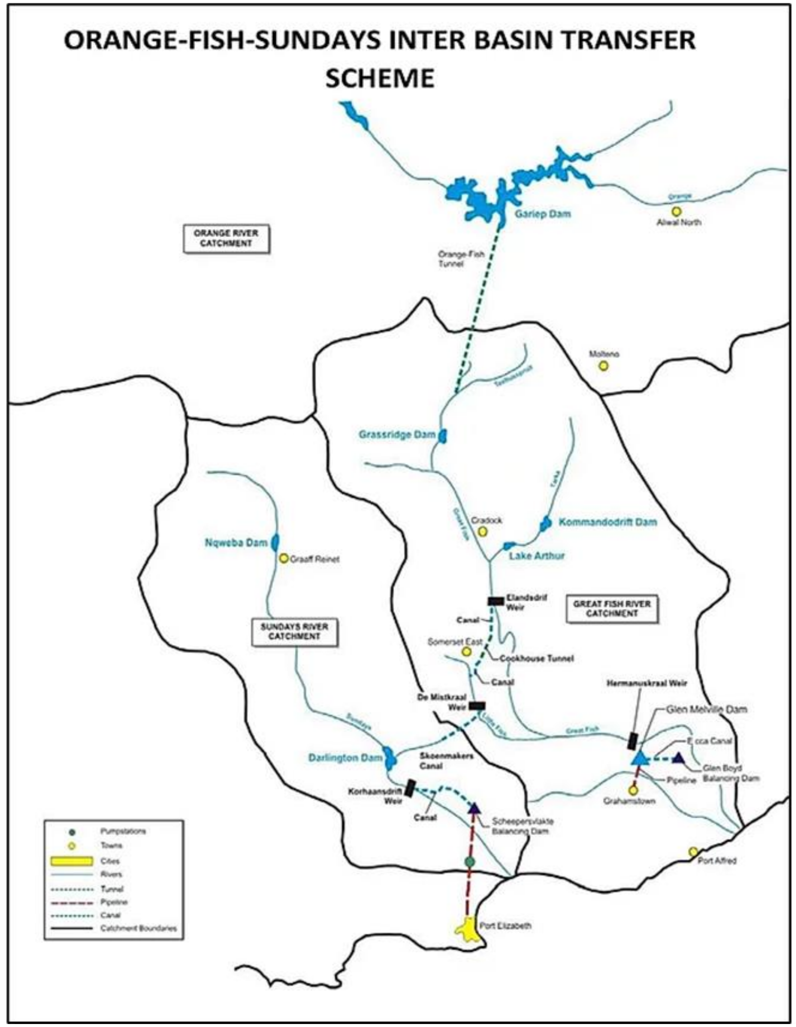
Water supplied to Gauteng comes from three different river catchments

1. Vaal Dam Catchment
2. The Senqu or Upper Orange River Catchment
3. The Thukela-Vaal Transfer Scheme



Inter basin transfers and return flows





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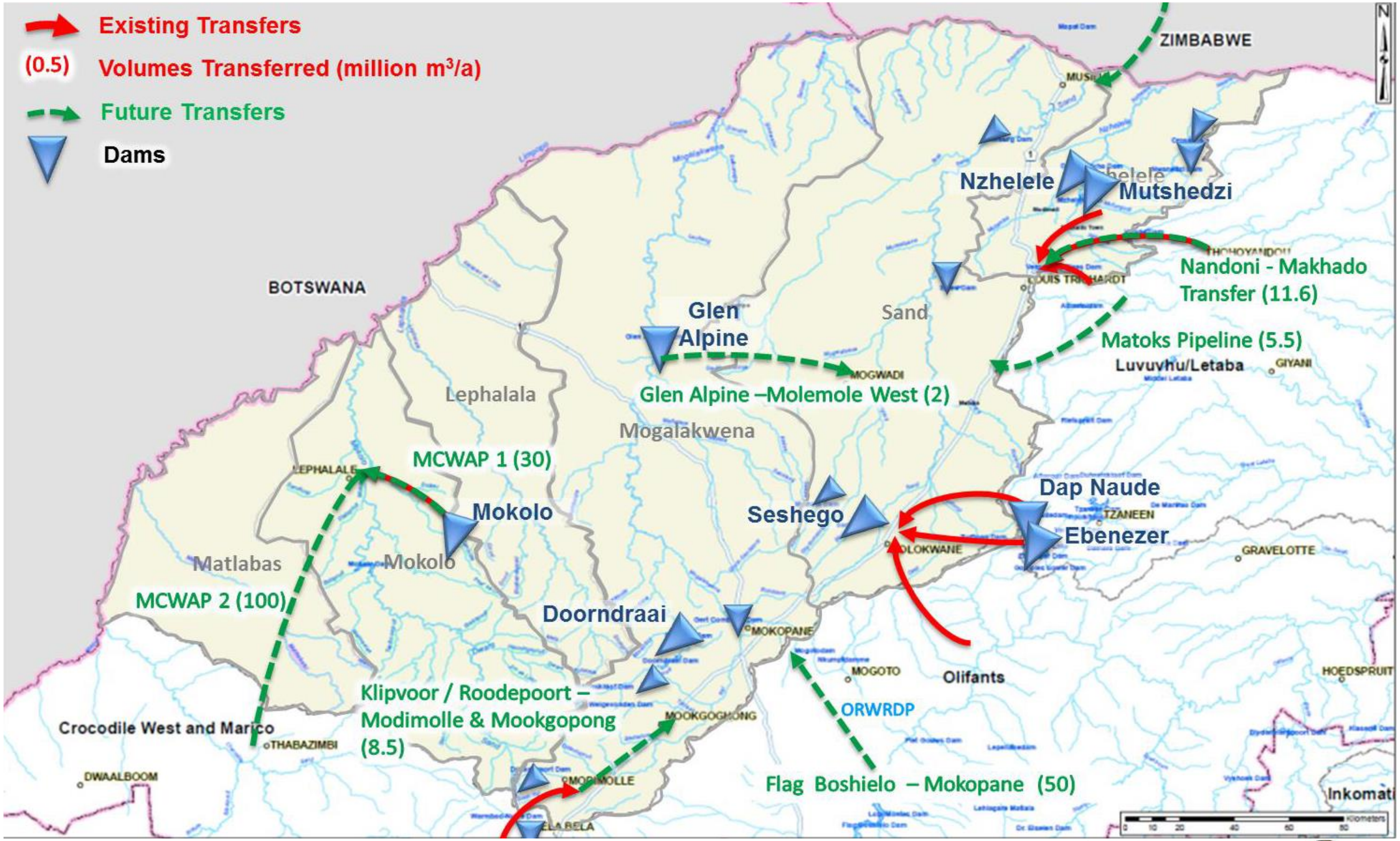
Inter basin transfers and return flows



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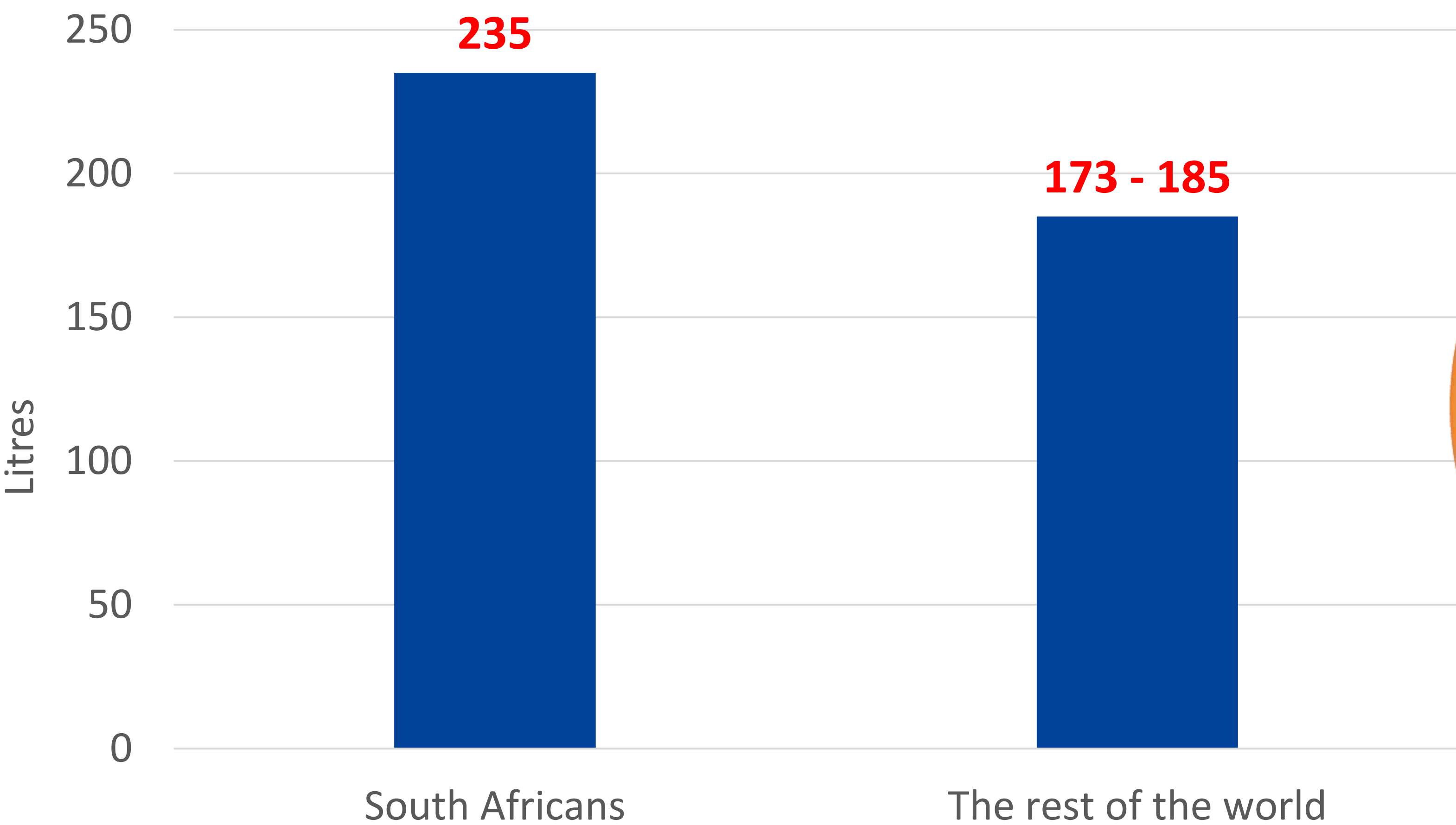
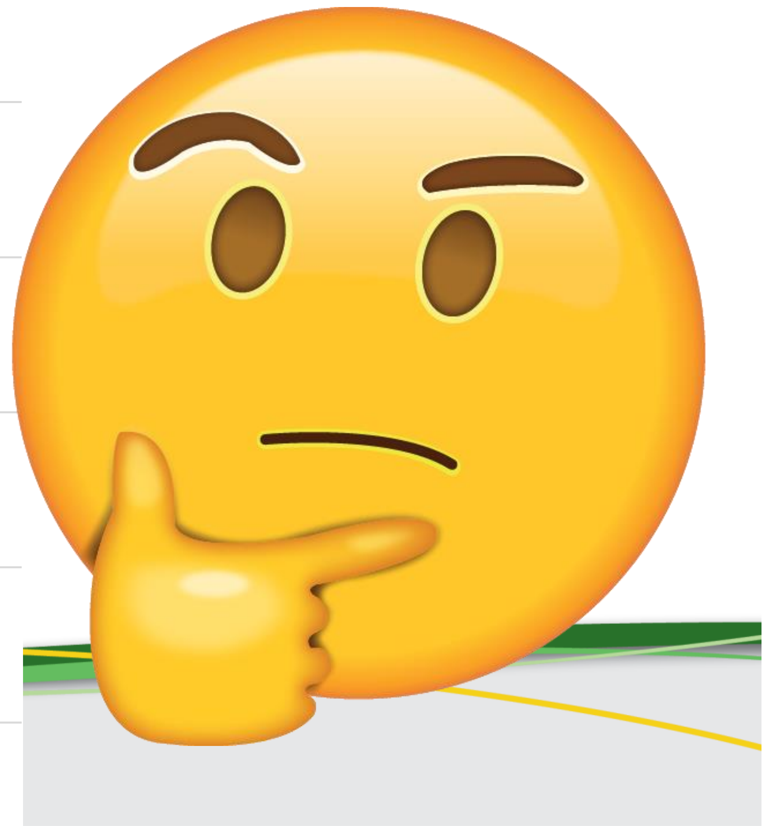
NEW NORMAL

- Water will become more EXPENSIVE (desalination? Re-use? Groundwater?)
- Everyone (except those without access to piped water) MUST use less water for the same activities
- Everyone - except the indigent - MUST pay for water and sanitation services



Gauteng 300L/p/d



So how does and will this impact our landscapes ?

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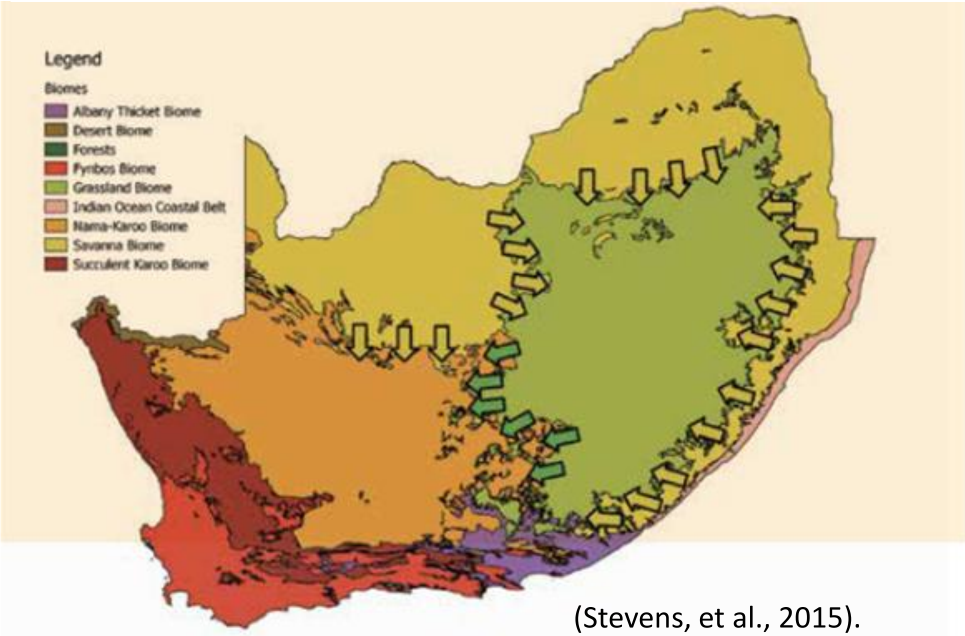
Forecasted impacts of climate change in South Africa & Africa

Changing biomes - expansion and contraction



(Stevens, et al., 2015).

FIGURE 2.2: PROJECTED CHANGE IN ANNUAL RAINFALL FROM 2071-2100 RELATIVE TO 1961-1990

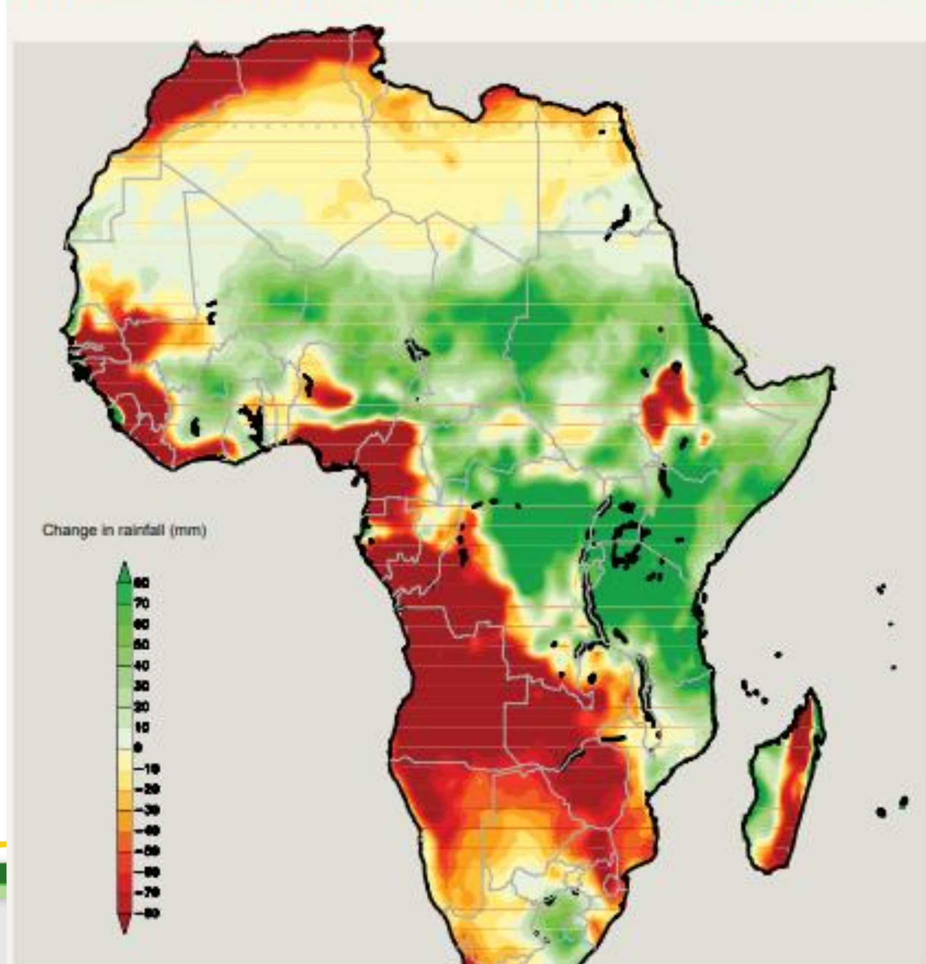
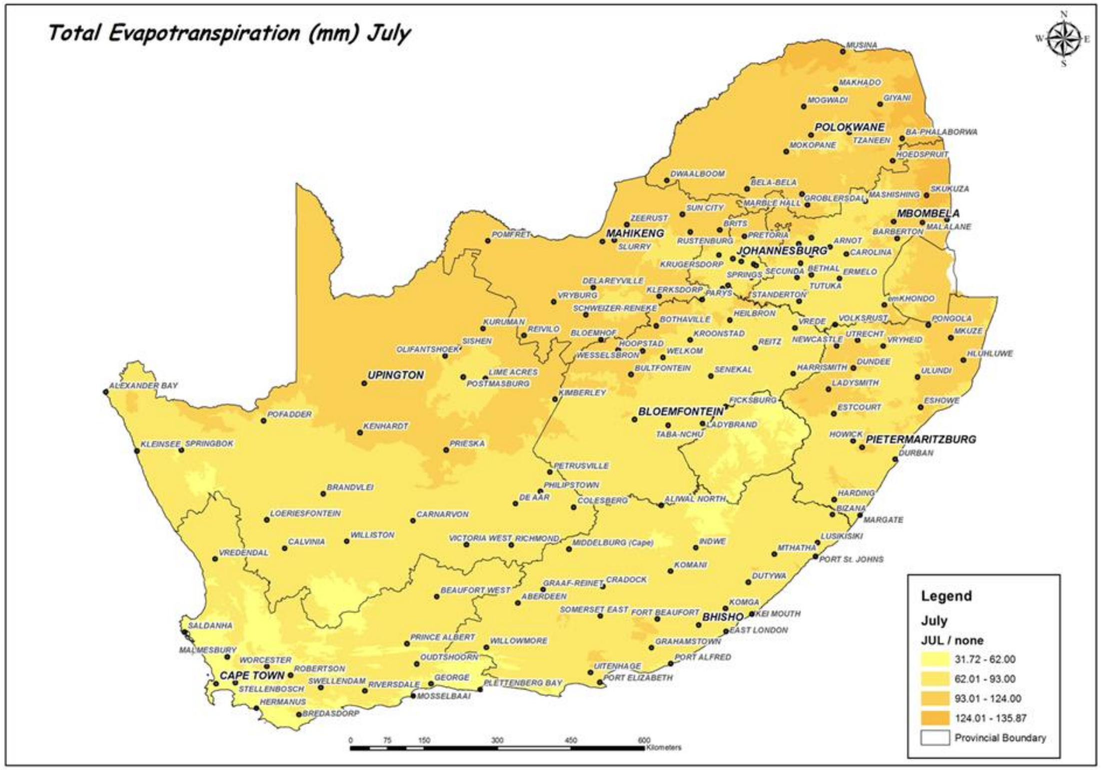
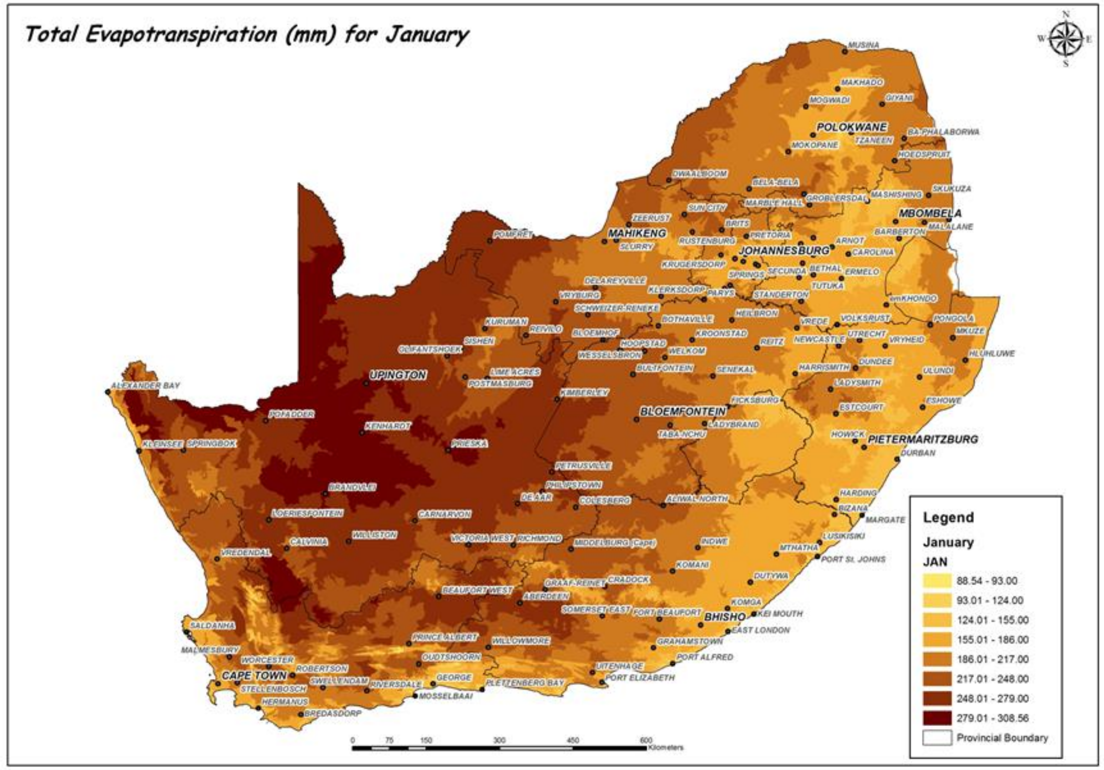


Image: Engelbrecht *et al*, 2015

Average Evapotranspiration for South Africa

July - Evapotranspiration rates vary from 31,72mm to 135,87mm





January evapotranspiration rates vary from 88.54mm to 308,56mm

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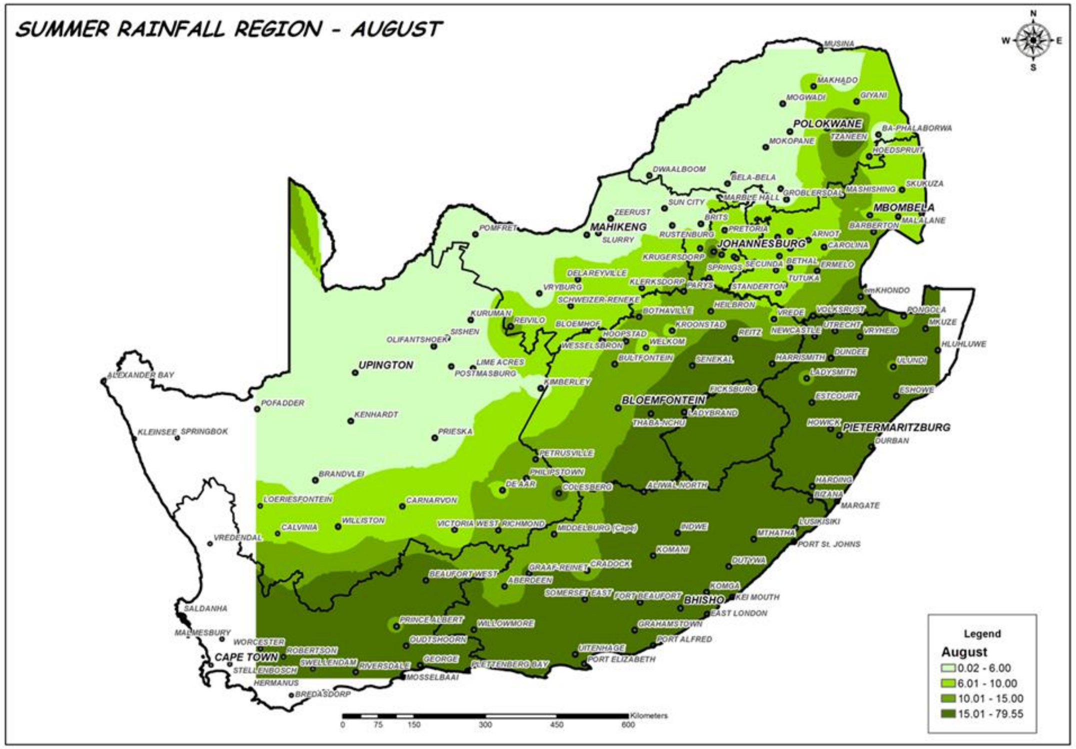
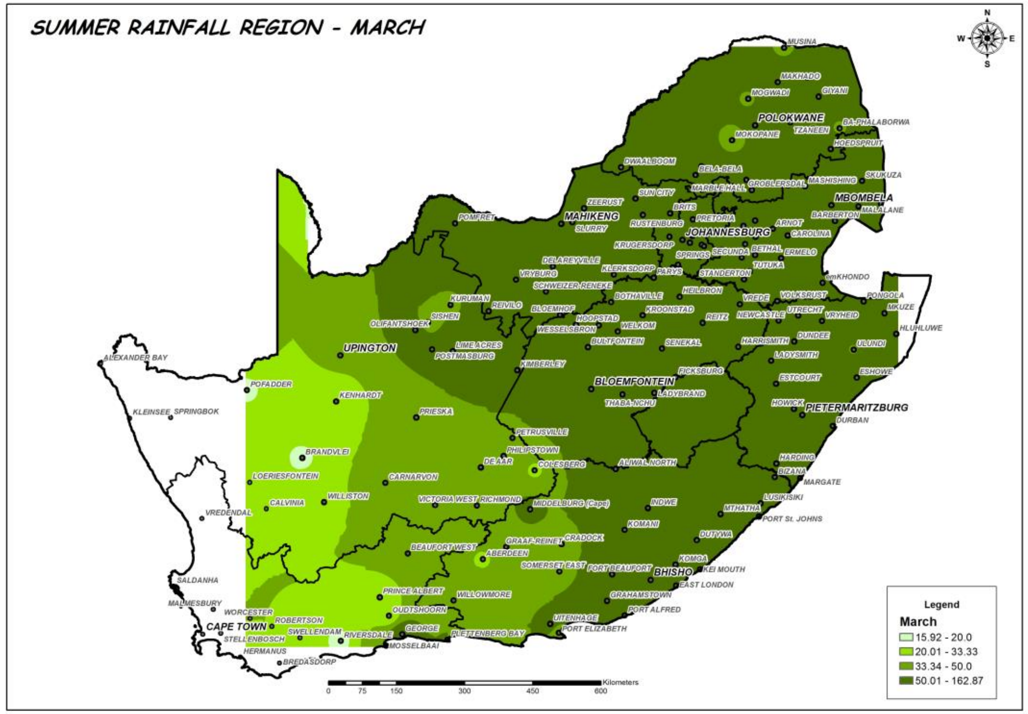
Summer rainfall region - South Africa

Summer rainfall – August rates vary from 0,02mm to 79,55mm





Summer rainfall – March rates vary from 15,92mm to 162,87mm

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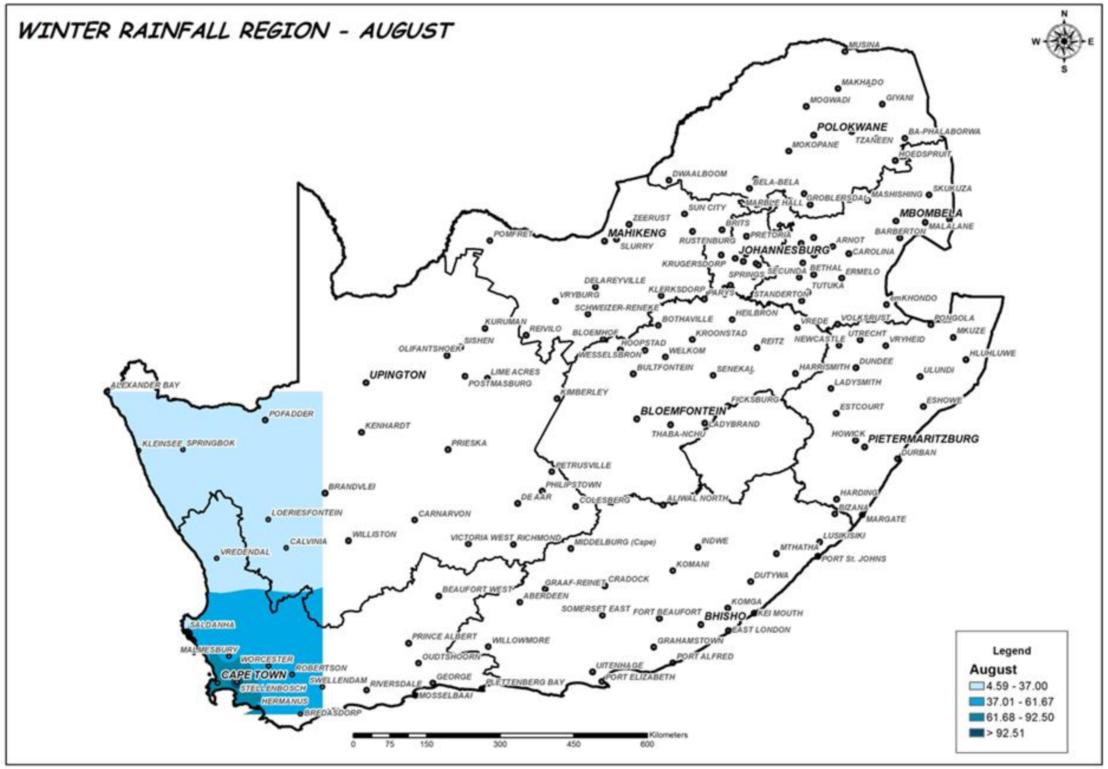
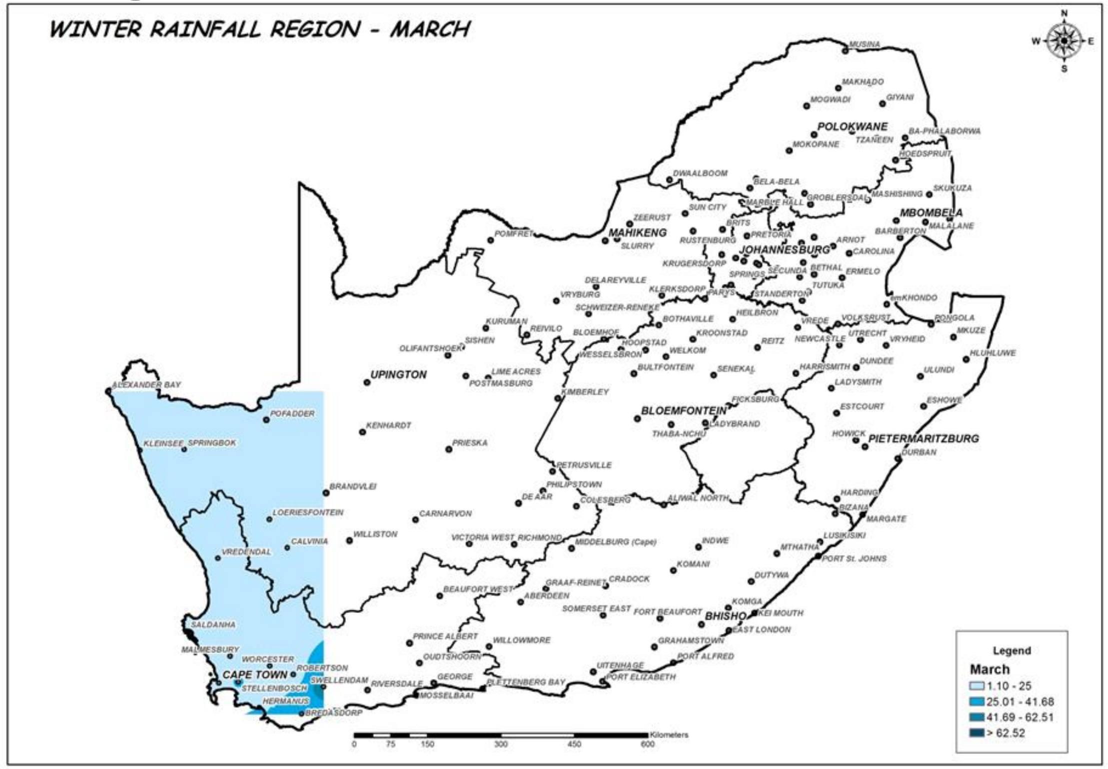
Winter rainfall region - South Africa

Winter rainfall – August rates vary from 4,59mm to 91,52mm

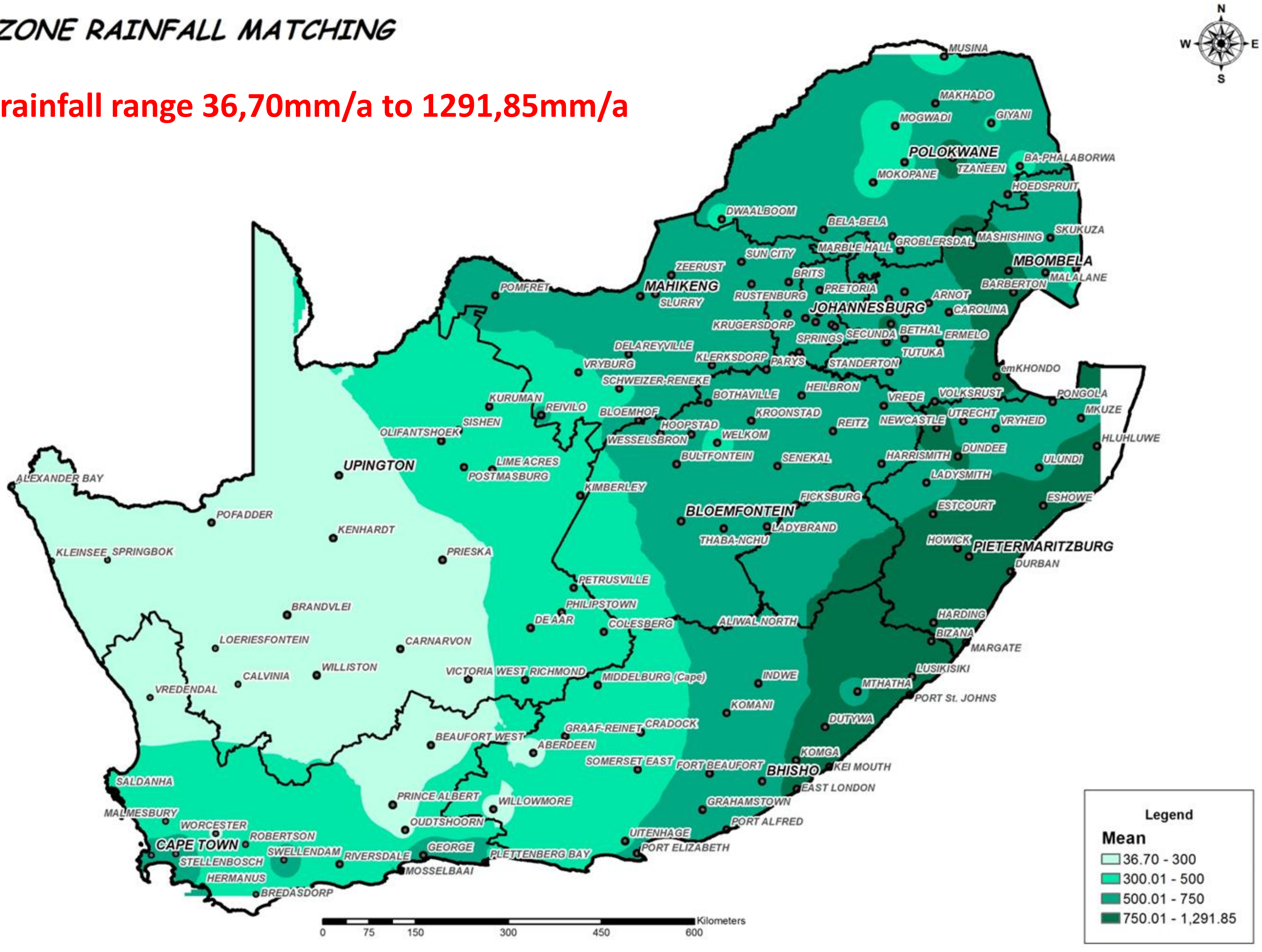




Winter rainfall – March rates vary from 1,10mm to 62,52mm

HYDROZONE RAINFALL MATCHING

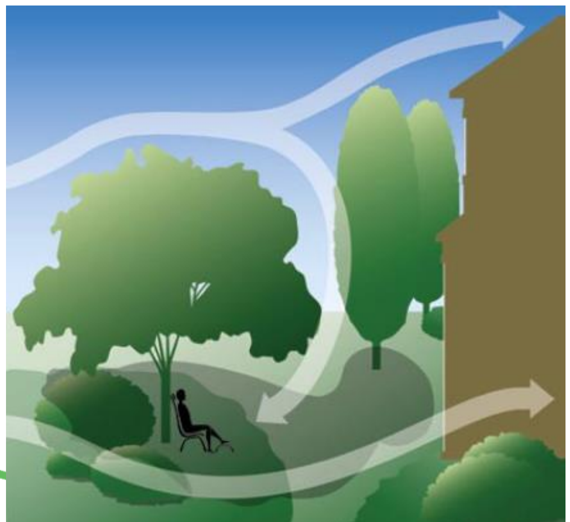
Mean rainfall range 36,70mm/a to 1291,85mm/a



Use of plants in the landscape

People centred

- Function
  - **Architectural** (Floors, walls & ceilings of outdoor rooms)
  - **Engineering** (Frame a view, screens, guiding along walkways, controlling runoff, limiting erosion)
  - **Environmental** (Biodiversity and ecological benefits, microclimates, wind, temperature)

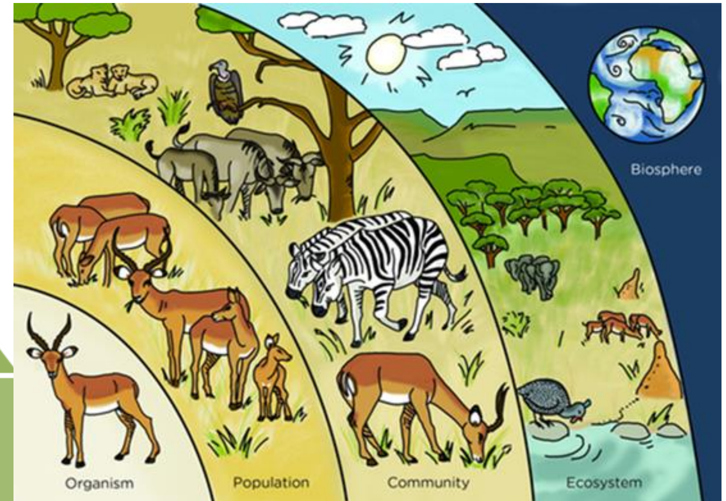


Ecosystem organisation

Individual/ organism

Population

Community



Ecosystem
- Microecosystem (specialized)
- Macro ecosystem (larger environ, multiple Micro)

Biome

Biosphere

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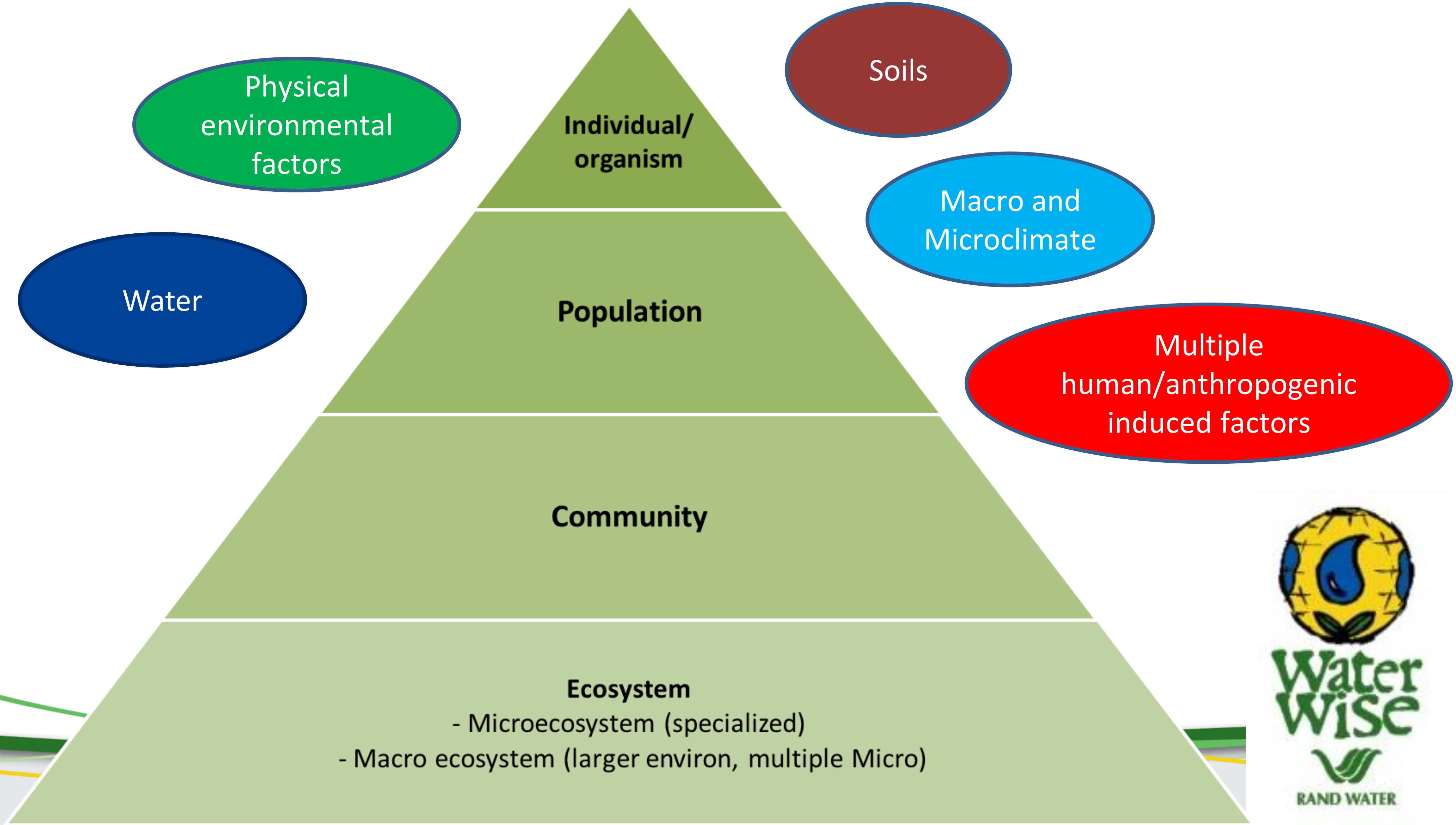
Impacts on our landscape ecosystems, communities and populations



Some **major** benefits of landscapes in urban areas

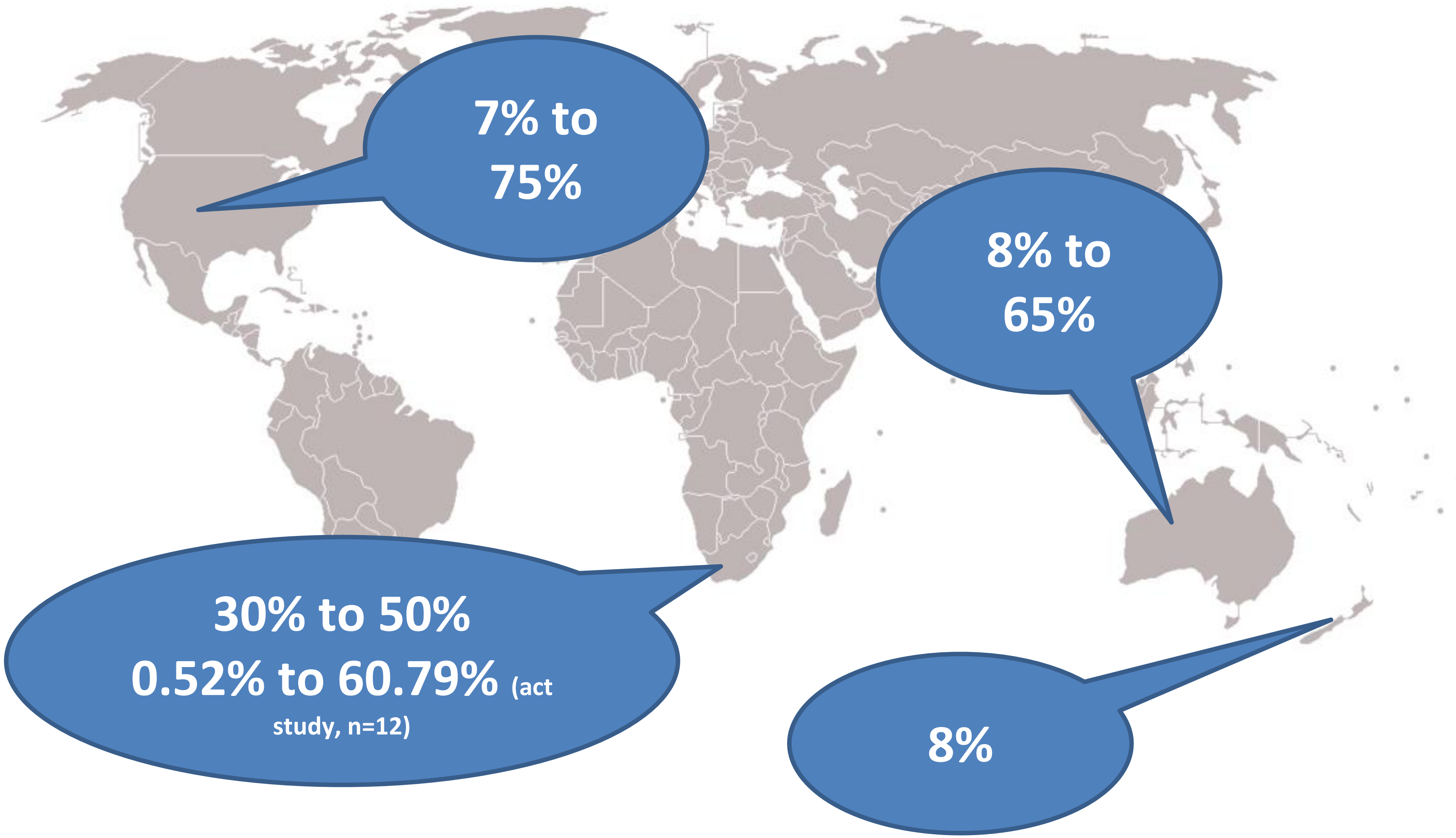
- Psychological effects and mental well being
- Physical well being (children's parks, exercise, sports etc.)
- Cooling effects (reducing impacts of heat islands)
- Promoting biodiversity and nature conservation
- Reduced water runoff
- Reduced erosion
- Improved air quality
- Reduced noise pollution
- Adjacent businesses and properties – can promote economic value & tourism
- Green lungs of our cities
- Allows users to relax and unwind and gather
- Sense of beauty to the viewers and users
- Even creates direct job opportunities
- Spiritual experience
- Benefits people of all ages

Water use in the landscaping industry

Why do we need to water plants?

- **When rainfall is insufficient** to support plant growth.
- **External water use varies depending on the location** of the landscape and the climate of the location (Devi, 2009).
- Plants require **sufficient water of adequate quality and at the right time** within the root growth zone for them to grow (FAO, 2017).
- **Plants are watered to replace water lost** through transpiration and the actual plant water needs for vascular growth.

Water use in the landscaping industry



Constraints that impact our cities and ultimately parks

Many changes outlined above will impact parks negatively including;

- Reduced natural rainfall
- Increased temperatures
- Increased pests
- Alien Invasive species “out of control”
- Polluted water sources

Some other existing and/or emerging challenges;

- Reduced revenue for parks
- Insufficient and reduced resources to maintain parks
- Poorly managed parks
- Illegal use of parks by the homeless and others
- Overuse of parks
- Vandalism

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Water constraints impact our parks as well

The City of Tshwane and Rand Water strenuously encourage residents to assist in conserving and using water sparingly by doing the following:

- **Do not water gardens between 6am-6pm;**
- Do not wash cars;
- Do not clean driveways or pavements using hosepipes;
- Do not fill swimming pools;
- Flush toilets only when necessary;
- Close a running tap while brushing teeth;
- Reduce daily water usage as much as possible;

Water use in the landscaping industry

The Green industry/IERM water challenge

- Generally, we don't know;
  - how much water **is needed for each hydrozone (hydro-station)** in the total landscape
  - how much water do we **use/apply for each hydrozone (hydro-station)** in the total landscape

- Landscapes that are incorrectly designed for the location
- Landscapes, where the ecosystem (as explained in previous slides) requirements are not considered

(Thankfully this scenario is changing but still has some way to go)

Proposed solutions to improved water use in landscapes

- Design for the local environment and consider ecology
- Water and environmentally resilient, landscapes
- Include many **<u>Water Wise</u>** aspects such as;
  - Hydrozoning linked to plant choices/pallets
  - Re-use of grey water
  - Soil improvement (compost, manures, organic fertilizers etc.)
  - Mulching
  - Alien invasive species
  - Improved weekly or fortnightly maintenance
  - Correctly designed irrigation systems to match plant pallet and landscape design
  - Collection of runoff or rainwater
  - Use of berms and swayles

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Proposed solutions to improved water use in landscapes

- Include many **<u>Water Wise</u>** aspects such as (cont);
  - Prevent any runoff water
  - Allow lawns to grow slightly longer
  - Encourage "meadow" effect in selected areas
  - Watering times and volumes
  - Grass blocks
  - Only watering of strategic focal areas within each park
  - Water retention granules
  - We fail to implement appropriate management oversite
  - Water meters
  - Leak fixing (maintenance of watering systems)
- Don't wait until it all collapses before you take action
- Intensive ongoing education and lobbying of staff, councilors and the public to counteract the challenges we face

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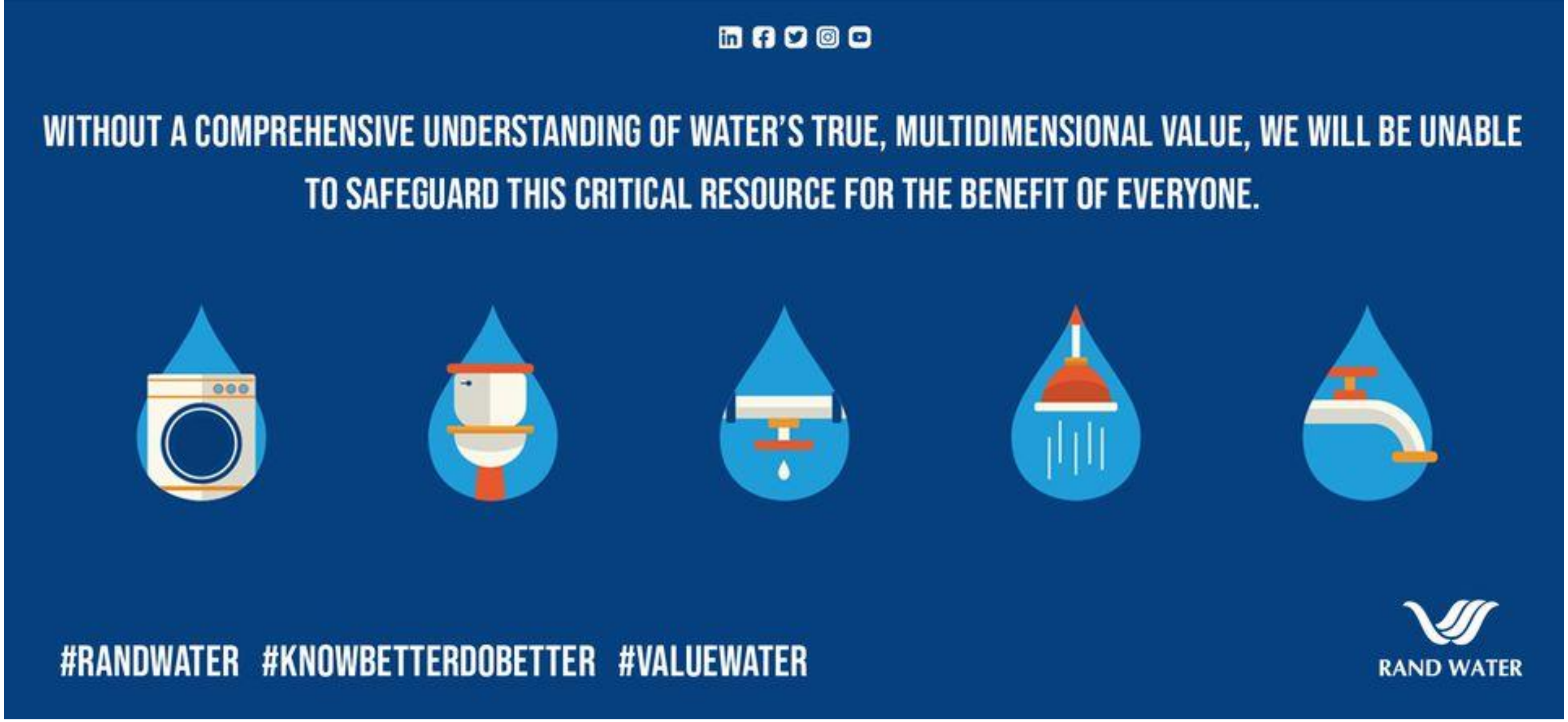
Closing notes:

- We need to plan and manage our landscapes and tree planting exercises, considering the future environmental and other social factors alluded to.
- There are many of research projects that are undertaken and need to be undertaken – IERM should **engage the various learning institutions to undertake research to resolve current problems**
- Rand Water wise is proactively engaged with water and environmental related research e.g.
  - Constructed wetlands for grey water use
  - Hydrozones and landscape water use
  - Basic grey water filters for vegetable production
  - Water Wise applications for small scale community vegetable gardens
  - Kikuyu lawn water use to start in 2024 with Unisa



"We can only aim to have resilient landscapes if we plan and maintain them considering water, society and the environment."

Thank you for your time

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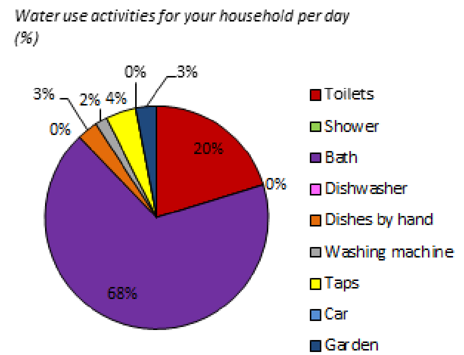
Most important: *BE INFORMED*

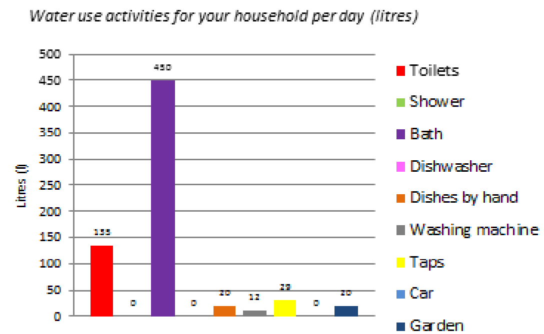
Your Water Wise Calculator

Have you ever wondered how much water you actually use every day? Water Wise has developed a calculator that can tell you approximately how much water you consume with your everyday activities. Try it!

	PER WEEK	PER DAY
TOTAL water consumption (litres):	4,654	666
TOTAL water consumption (kilolitres):	4.7	0.7
TOTAL water use per day PER PERSON (litres):		1024

TOTAL water consumption per month (kilolitres):	20.0
Monthly cost (Rand):	R 274.11





For more information on this and other Water Wise activities, please visit www.randwater.co.za and click on the Water Wise logo, or call 0860 10 10 60.